

REMARKS

Please reconsider the application in view of the above amendments and the following remarks.

Disposition of Claims

Claims 16-25 are pending in this application; former Claims 15 and 26 have been cancelled, and new independent Claim 27 has been added. Claims 16-25 have been amended to depend from new Claim 27 rather than Claim 15.

Rejection(s) under 35 U.S.C § 112

Original Claim 15 was rejected under 35 U.S.C § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the inventive subject matter. New independent Claim 27 has been drafted to avoid the cited instances of ambiguity and to provide proper antecedent basis for the claimed elements. Claim 22, now dependent on new claim 27, is amended to correct the inconsistency noted in the Office action. Rejected Claim 26 has been cancelled.

Rejection(s) under 35 U.S.C § 102 and 35 U.S.C § 103

The claims as originally presented were rejected under 35 U.S.C § 102 and/or 35 U.S.C § 103 as anticipated by or obvious over Callebort et al., Demuith, Manabe et al., Gsell in view of Manabe or Goldbe4rg, or optionally, in view of Siemon. As presently presented, all the claims are believed clearly to distinguish the cited references, alone or in any combination suggested by the references. New Claim 27 is distinguished, *inter alia*, in

its recitation of the step of:

providing a precursor porous article having an exterior surface, an interstitial surface and a bulk matrix, the exterior and interstitial surfaces and bulk matrix both comprising organic polymers, the porous article having an interconnected network of open pores, the open pores having pore surfaces extending from interior portions of the porous article to the exterior surface of the porous article and having exterior pore surfaces consisting of pore surfaces opening directly to the macroscopic external surface of the porous article, and having interstitial, internal pore surfaces interior to the porous article and contiguous with the exterior pore surfaces

None of the cited references suggest such a method step. The process is additionally defined as a process for introducing functionality to the pore surfaces of a porous article, the article having a continuous interconnected network of open pores such that the pore surfaces form a continuous surface reaching from the interior of the porous article to the exterior surface. The provision of such a porous article, having an interconnected network of open pores having pore surfaces extending from the interior of the porous article to the exterior surface, is not shown in the art and is of importance to the operation of the process. The porous structure, and its utility in the claimed process, are described in Applicant's specification at page 9, lines 11, through page 12, line 19. Processes for forming the porous structure are described in the specification at page 10, line 20 through page 12, line 2.

Claim 27 is further distinguished over the cited art in its recitation of the step of:

exposing the precursor porous article to a flowing gas containing reactive atomic or molecular radicals....the gaseous flow being maintained such that atomic or molecular radicals are formed in the gaseous discharge and flow to the porous article in sufficient quantity that radicals from the discharge react with the organic polymers present at the exterior and interstitial surfaces of the precursor porous article to introduce direct covalent bonding of functionality to the surfaces, the functionality selected from the group consisting of amino, hydroxyl, carbonyl and carboxyl groups, and sufficient to introduce between 1 x

10^{-4} and 1×10^{-6} micromoles of reactive functionality per square cm of pore surface.

The cited art does not teach or suggest such a method step. In particular, it has not been shown or suggested to introduce a radical-containing gaseous flow of a concentration and pressure sufficient to introduce such levels of reactive functionality. The preparation and application of the gaseous flow are described in Applicant's specification at page 20, line 1, through page 21, line 26, and elsewhere, and the levels of reactive functionality are stated in the examples, e.g., at page 36, line 20, through page 37, line 6, and with respect to Example 2, pages 32 – 35.

Accordingly, it is respectfully asserted that none of the references cited by the examiner anticipate the invention as claimed. The invention, as claimed and described, comprises a porous article with reactive organic functionalities on the pore surfaces. The pore surfaces and functionalities have specified performance properties and ranges of properties. The specific process used to produce the porous article must demonstrate the ability to produce the *specified* porous article. It is *not obvious* that any of the alleged prior art or combinations of alleged prior art can produce the *specified* porous article. To make such a statement would in essence constitute hindsight, based on Applicant's own teachings, because the reaction-diffusion kinetics and basic materials chemistry have to be demonstrated experimentally, and cannot be predicted. The fact that the process described produced the specified article was in itself a surprising discovery, not an obvious extension of the prior art. Although many of the processes alleged to be prior art were known to the Applicant, none were shown to introduce reactive organic functionalities and the specified surface concentration, uniformly throughout the porous

material with no evidence of external or internal surface degradation as observed with SEM.

The uniformity and completeness of surface functionalization throughout the porous article or the fraction thereof that was treated has been further demonstrated. The specification demonstrates the agreement between XPS measurements on the external surface of a porous article and the overall measurement of reactive functionality introduced by the subject process as measured by FITC.

In addition, the uniform and complete wetting (with high purity water 5) of the porous polyethylene disks that were produced using the subject process (*Example 2, page 32-35*) did not in itself demonstrate the uniform treatment of the interior and exterior surfaces functionalized by the process in a precise and quantitative way. The subject gaseous radicals react with the organic polymers on the pore surfaces so as to produce organic functionalities selected from the group of consisting of amino, carbonyl, carboxyl and hydroxyl, such that the subject pore surface organic functionalities introduced by the subject process are accessible to and reactive with solutions of various organic functional group probe molecules such as FITC (Fluorescein -5-isothiocynate), DTAF (5-(4-6-dichlorotriazinylamino)fluorescein) (*Example 3, Page 36, lines 11-20*), molecular probe D-1557, or reactive polymers or polymer colloids, (*Example 4, page 37, lines 4-20*) after the porous article is removed from the flowing or downstream gaseous discharge environment. As noted above, the subject process introduces between 1×10^{-4} and 1×10^{-6} micromoles of reactive functionality per square cm of pore surface, in agreement with the values observed for exterior pore surfaces using XPS. In addition SEM examination of the internal and external pore surfaces of the porous article reveals

no change in pore surface morphology or pore surface roughness in either pore population at SEM magnifications of 50 X up to 2000X (*page 27, lines 11-26*).

Accordingly, new Claim 27 has been demonstrated to recite a combination of method steps not shown or suggested in the cited art and which produces new and non-obvious technical results not previously available. It is respectfully urged that patentability has been demonstrated, and that the claim should be allowed.

Claims 16-25:

Claims 16-25 are dependent upon new Claim 27 and are believed allowable for substantially the same reasons provided above with respect to Claim 27, and additionally with respect to the further limitations presented in the respective claims.

Conclusion

The claims have been shown to be allowable over the cited art. Applicant believes that this paper is responsive to each ground of rejection cited by the Examiner in the Action dated January 3, 2003, and respectfully requests favorable action in the form of a Notice of Allowance.

The requisite fees, if any, are submitted herewith. No other fees are believed to

be due for this submission. However, should there be any additional fees required, please charge such additional fees to Deposit Account No. 14-0116.

Respectfully submitted,

James M. Cate

James M. Cate, Reg. No. 25,181
Attorney for Applicant

NASA Johnson Space Center/HA
NASA Road One
Houston, Texas 77058
Telephone: 281-483-1001 or -4871 Datafax: 281-244-8452

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to the Mail Stop Non-Fee Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

June 27, 2003

Signature

James M. Cate

James M. Cate

RECEIVED
JUL 08 2003
GROUP 1700